CLAIMS

1	1. An electrostatic actuator formed in a single layer comprising:
2	a stator formed in the layer comprising a first plurality of fingers;
3	a rotor formed in the layer comprising a second plurality of fingers,
4	wherein:
5	one or more of the fingers of the second plurality is between the fingers of
6	the first plurality, and
7	one or more fingers of the stator and rotor are positioned above a
8	conducting plane having the same potential as the rotor, and
9	one or more fingers of the rotor has a height less than or equal to one or
10	more fingers of the stator such that a vertical force is exerted upon the rotor, the
11	height measured from the bottom of the finger to the top of the finger.
1	2. The electrostatic actuator of claim 1 wherein the single layer is a
2	single layer of a wafer, the single layer comprising a semiconducting material.
1	3. The electrostatic actuator of claim 1 wherein the single layer
2	comprises a conductive material.
1	4. The electrostatic actuator of claim 1 wherein the single layer
2	comprises an insulating material.
1	5. The electrostatic actuator of claim 1 wherein the rotor further
2	comprises a central portion, the central portion forming part of a micro-optical
3	component.

- 6. The electrostatic actuator of claim 5 wherein the micro-optical component has one or more filter elements, and wherein one or more of the second plurality of fingers moves one or more of the filter elements.
 - 7. The electrostatic actuator of claim 5 wherein the micro-optical component attenuates or switches an input signal by rotation of the central portion of the rotor.
 - 8. The electrostatic actuator of claim 1, wherein a positive vertical force is exerted upon one or more of the rotor fingers such that the rotor is vertically moved from the plane of the stator.
 - 9. The electrostatic actuator of claim 5 wherein a positive vertical force is exerted upon one or more of the rotor fingers causing the central portion of the rotor to rotate about an axis.
 - 10. The electrostatic actuator of claim 5, wherein a positive vertical force is exerted upon one or more of the rotor fingers and a negative vertical force is exerted upon one or more of the rotor fingers such that the central portion of the rotor is rotated about an axis.
 - 11. The electrostatic actuator of claim 5 further comprising one or more springs formed in the layer, the springs connected to the central portion of the rotor.
 - 12. The electrostatic actuator of claim 10, wherein the central portion of the rotor is rotated about an axis aligned with the springs.

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1	13.	The electrostatic actuator of claim 1, wherein the conductive plane
2	is located bel	ow the fingers at a first side of the actuator, but not below the fingers
3	at a second si	de of the actuator.
1	14.	The electrostatic actuator of claim 13, wherein a positive force is
2	created at the	first side and a negative force is created at the second side.
1	15.	The electrostatic actuator of claim 14, wherein the actuator pivots
2	about an axis	located between the first and second side of the actuator.
1	16.	The electrostatic actuator of claim 1, wherein the layer comprises
2	silicon, and t	he rotor and stator comprise the silicon.
1	17.	The electrostatic actuator of claim 1 further comprising an
2	insulating lay	ver below the silicon layer.
1	18.	The electrostatic actuator of claim 17 wherein the fingers of the
2	stator and rot	or are formed within the silicon layer by etching the silicon layer and
3	the insulating	g layer.
1	19.	The electrostatic actuator of claim 13 wherein the insulating layer
2	is silicon dio	xide.
1	20.	The electrostatic actuator of claim 13 further comprising a silicon
2	layer below t	he insulating layer, and wherein the fingers of the stator further
3	comprise the	insulating layer sandwiched between the silicon layer above and
4	below the ins	sulating layer.
1	21.	A method of forming an electrostatic actuator in a wafer

layer having a height x on the insulating layer, the method comprising:

comprising a silicon substrate, an insulating layer on the substrate, and a silicon

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4	etching a trench having a depth y within the silicon layer; and thereafter
5	etching the silicon layer and the trench to the insulating layer to form a
6	rotor finger of height x-y and a plurality of stator fingers of height x; and
7	etching a portion of the insulating layer below the rotor and the stator
8	fingers.
1	22. The method of claim 21 further comprising depositing a
2	photoresist layer within the trench yet narrower than the trench prior to etching
3	the silicon.
1	23. The method of claim 23 further comprising etching the silicon
2	substrate from the bottom of the wafer to form a central portion of the rotor.
1	24. The method of claim 23 further comprising etching a portion of the
2	insulating layer to form a central portion of the rotor.
1	25. The method of claim 23 further comprising depositing a reflective
2	coating upon the central portion of the rotor.
1	26. The method of claim 21, wherein the insulating layer comprises
2	silicon dioxide.
1	27. An electrostatic actuator formed in a wafer having a first
2	conductive layer, a second conductive layer and an insulating layer between the

first and second conductive layers, the actuator comprising:

comprising:

7	a rotor comprising a second plurality of fingers, the rotor formed in the
8	second conductive layer, and wherein:
9	one or more of the fingers of the second plurality is between the fingers of
10	the first plurality, and
11	when a voltage is applied to the conductors of the stator a vertical force is
12	exerted upon one or more fingers of the rotor.
1	28. The actuator of claim 27 wherein the second plurality of fingers is
2	coplanar with the bottom conductor of the first plurality of fingers.
1	29. The actuator of claim 27 wherein the rotor further comprises a
2	central portion that is moved by the vertical force.
1	30. The actuator of claim 29, wherein the central portion is rotated
2	about an axis.
1	31. The actuator of claim 29, wherein the central portion is moved
2	substantially vertically from the substrate.
1	32. The actuator of claim 27 wherein the force moves a filter element
2	of a tunable filter.
1	33. The actuator of claim 27 wherein the force rotates a reflective
2	element to direct an input beam.
1	34. An electrostatic actuator formed in a insulating layer, the actuator

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3	a stator comprising a first plurality of fingers having an insulating portion
4	formed in the insulating layer, and a conductive portion upon the insulating
5	portion;
6	a rotor comprising a second plurality of fingers, the rotor formed in the
7	insulating layer, and wherein:
8	one or more of the fingers of the second plurality is between the fingers of
9	the first plurality, and
10	when a voltage is applied to the conductive portions of the stator fingers a
11	vertical force is exerted upon one or more fingers of the rotor.
1	35. The electrostatic actuator of claim 34 wherein the insulating
2	portion of the stator is coplanar with the rotor when the voltage is not applied to
3	the stator.
1	36. The electrostatic actuator of claim 34 wherein when the voltage is
2	applied the vertical force moves the rotor such that it is coplanar with the
3	conductive portions.
1	37. The electrostatic actuator of claim 36, wherein the rotor movemen
2	pivots a micro-optical component connected to the rotor.
1	38. The electrostatic actuator of claim 37, wherein the rotor movemen
2	pivots a mirror.
. 1	39. The electrostatic actuator of claim 37, wherein the micro-optical
2	component is a tunable filter.

An MEMS actuator comprising:

2	a stator having a plurality of fingers comprising an insulating material, and
3	a conductive material upon the insulating material;
4	a rotor having a plurality of fingers consisting of an insulating material,
5	and wherein:
6	the fingers of the rotor are inter-digital with the fingers of the stator, and
7	the insulating material of the stator is coplanar with the insulating material
8	of the rotor when no voltage is applied, and
9	when a voltage is applied to the conductive material of the stator, a force is
10	created moving the rotor upward towards the conductive material of the stator.
1	41. The MEMS actuator of claim 40, wherein the insulating material of
2	the rotor and the stator are formed within the same layer of a wafer.
3	42. The MEMS actuator of claim 40, wherein the insulating material of
4	the rotor and stator are formed from different wafers.